Difference Equations

2.1.1 Compound Interest

2.1.2 Loan Repayment

2.1.3 Gambler's Ruin

2.2.2 Exponential Population Growth

2.2.3 Average Lifespan

2.2.$\star$ Rabbit Populations

2.2.4 Nonlinear Population Models

2.1.2 Loan Repayment

You just took a loan to buy a car. You'll need to make fixed payments every period, and the bank will charge an interest on the amount you still owe every period.

2.1.2 Loan Repayment

You just took a loan to buy a car. You'll need to make fixed payments every period, and the bank will charge an interest on the amount you still owe every period.

- D_k = amount of money owed to the bank after k periods
- $p\%$ = annual interest rate
- α = length of a payment/compounding period (in years)
- R = payment amount per period

1. Find an equation relating D_{k+1} with D_k.

2. Calculate $D_1, D_2, D_3, \ldots$ in terms of D_0 until you find a pattern. What is D_k?

2.1.2 Loan Repayment

3. What is an equilibrium solution D_{eq}?
4. Sketch a graph of some possible outcomes for D_k.

2.1.2 Loan Repayment

3. What is an equilibrium solution D_{eq}?
4. Sketch a graph of some possible outcomes for D_k.

5. If

$$D_0 = \$20\,000.00 \quad , \quad p = 20\% \quad , \quad \alpha = \frac{1}{12}$$

then what is the monthly payment R so that the loan will be paid off in 5 years?

6. If the monthly payment is $R = \$1\,000.00$, how many periods does it take to pay off the loan?

Preparation for next lecture

Section 4.5.

- Know how to use the Method of Undetermined Coefficients.
  https://youtu.be/YRvqem1n0nQ